EUROPEAN UNIVERSITY OF LEFKE

FACULTY OF ENGINEERING

Graduation Project I

Smart Shades

Ali Hikmet Keklik

180151

Smart shades, as the name suggests, is a shades that can be opened automatically without any effort, can be used in home, office etc. environments and makes life easier. A smart shades that is sensitive to sunlight and can be controlled remotely.

Supervisor

Prof. Dr. Cem Burak Kalyoncu

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1.Introduction

Smart shades are a type of window treatment that can be opened and closed automatically, often through the use of motors or other automation systems. They can be used in a variety of settings, including homes and offices, and are designed to make life easier by allowing users to control the shades remotely or through the use of sensors that detect sunlight or other stimuli. Smart shades can also be programmed to open and close at specific times or in response to other triggers, such as temperature or humidity.

1.1 Problem definition

The smart shades system, which can be remotely controlled via the website, allows users to open and close their shades with a single button without standing up and using power. In addition, the system should be able to detect the presence of sunlight and automatically adjust the position of the blinds accordingly, helping people wake up easily, helping to regulate the temperature in a room with the sun's rays.

Example-Problems :

- Being lazy to stand up to open and close the shades.
- Waking up in a dark environment.
- The shades are closed when the sun is shining outside and the room gets cold.

1.2 Goals

You should write down your goals and explain the purpose of the project in detail, also you need to write benefits of the project .

You should write your Goals and their details.

- Develop a user-friendly web-page that allows users to easily open and close their shades with the touch of a button.
- Design a system that is reliable and able to function consistently in a variety of settings, including homes and offices.
- Integrate the system with sensors that can detect the presence of sunlight and adjust the position of the shades accordingly.
- Integrating temperature sensors inside the room and outside the room. So If the air inside is cold and outside is warm, the shades will open automatically. When it's the other way around, the shades will close.

- Algorithm that automatically turns on and off at the specified time and present it to the user in the web interface.
- Program the system to open and close the shades at specific times or in response to other stimuli, such as temperature.
- Test the system thoroughly to ensure that it meets all of the specified requirements and functions as intended.

2. Literature Survey

It is difficult to determine the exact date of the first smart shades, as there have likely been many different prototypes and innovations in this field over the years. However, smart shades have become more widely available and popular in recent years with the proliferation of smart home technology. Some early examples of smart shades or window treatments that can be controlled remotely include the Somfy myLink, which was released in 2013, and the Lutron Serena, which was released in 2014. Before comparing with other smart shades let's go over our own smart shades. The smart shades system that I am going to develop can be controlled through a web interface and integrated with sensors that can detect the presence of sunlight, temperature. This system is intended to be user-friendly and reliable, and it should be able to function consistently in a variety of settings.

Compare1 : In 2014, Serena Smart Shades were released. One aspect of these shades that is similar to our Smart Shades is that the components that make the shades smart are integrated into the shades itself, rather than being an add-on piece. Another similarity is the ability to control the shades remotely. However, our Smart Shades system has the additional feature of being able to be controlled through a web interface using any device with internet access. In contrast, Serena Smart Shades are a more basic smart shades system, only offering remote control functionality. Our system has a range of additional features, such as the ability to open and close the shades based on sunlight or temperature levels, as well as the option to set specific times for the shades to open and close. [1]

Compare2: Somfy mylink: Somfy's smart shades system is different from our Smart Shades in that it is an add-on piece that can be hung on an existing shades to make it smart. Like our system, Somfy's system can be controlled remotely using a smartphone or tablet but it has application. However, our system has a web interface using any device with internet access. Our system offer the ability to set specific times for the shades to open and close. Our system

also has additional features such as the ability to open and close the shades based on sunlight or temperature levels. [2]

Compare3 : SwitchBot's smart curtain system. This is the smart shades that is the most similar to our smart shades but it still has a lot of differences. It is similar to our Smart Shades in that it can be controlled remotely using a smartphone or tablet. The difference is it has mobile application and we have website. Like our system, it also offers the ability to set specific times for the curtains to open and close. However, SwitchBot's system is only compatible with side-opening shades, while our system can be used roller shades. In addition, SwitchBot's system is an add-on piece that can be attached to the shades, similar to Somfy's system, while our system has the components integrated into the shades itself. Both SwitchBot's and our system allow for remote control. Our system also has additional features such as the ability to open and close the shades based on sunlight or temperature. SwitchBot's system is also compatible with Alexa, which allows users to control it using voice commands. [3]

Compare4 : SONTE Film is a technology that allows the color of the film to change from transparent to non-transparent. I'm adding this to the comparison because it's also a kind of smart window covering system. The similar thing can be controlled remotely from a smart device. [4]

3. Background Information

3.1 Required software

- **HTML**

  HyperText Markup Language is a standard markup language used for creating web pages.
- **CSS**

  Cascading Style Sheets is a style sheet language used for describing the look and formatting of a document written in HTML.
- **Bootstrap**

  Bootstrap is a free front-end framework for faster and easier web development. It includes HTML and CSS based design templates for typography, forms, buttons, tables, etc.
- **JavaScript**

  JavaScript is a programming language commonly used in web development to add interactivity to websites.
- **C++**

  C++ is known for its ability to handle complex tasks and perform well in resource-constrained environments. It is often used for applications that require high levels of performance or that need to interact with low-level hardware components.
- **Arduino**

  The Arduino software is a free, open-source platform that includes a development environment and libraries for creating software that can interact with hardware devices.

3.2 Other software

- **Bitbucket :**

  Bitbucket is a web-based version control repository hosting service for source code and development projects.
- **Git :**

  Bitbucket is a web-based version control repository hosting service for source code and development projects.
- **Visual Studio Code :**

  Visual Studio Code is a code editor developed by Microsoft for Windows, Linux, and macOS. It includes support for debugging, source control, and code refactoring.

3.3 Hardware

- **NodeMCU V3 ESP8266 ESP :**

The NodeMCU V3 ESP8266 ESP is a low-cost microcontroller with built-in WiFi support. It can be used to control devices wirelessly over the internet.

- **12V 12mm 120 RPM DC Motor :**

  A DC motor is an electric motor that runs on direct current (DC) electricity. The 12V 12mm 120 RPM version is a small, low-voltage motor that rotates at a speed of 120 revolutions per minute.

- **Mikro Limit Switch :**

  A limit switch is a mechanical switch that is activated by the motion of an object. The Mikro limit switch is a small, high-precision switch that can be used to detect the end positions of moving objects.

- **L298N Motor Driver :**

  The L298N Motor Driver is a dual H-bridge motor driver that can be used to control the speed and direction of two DC motors.

- **LM335AZ TMP Sensor :**

  A temperature sensor that can be used to measure the temperature of a device or environment.

- **LDR :**

  A light-dependent resistor, also known as a photoresistor, is a type of resistor that changes resistance based on the amount of light it is exposed to. It can be used to detect the presence of sunlight or other sources of light.

4. Modules

4.1 Shade Control

This module will involve designing and implementing the system that controls the opening and closing of the shades. This will involve using the NodeMCU V3 ESP8266 ESP and the 12V 12mm 120 RPM DC Motor to drive the motor that moves the shades, as well as the Mikro Limit Switch to detect the end positions of the shades. The L298N Motor Driver will be used to control the motor, and the system will be programmed to respond to user input through the web interface.

4.1.1 Sensors

This module will involve integrating the system with sensors that can detect the presence of sunlight and adjust the position of the shades accordingly. This will involve using the LM335AZ TMP sensor to measure temperature and determining when to open or close the shades based on the temperature difference between the inside and outside of the room.

4.1.2 Algorithm

This module will involve developing an algorithm that automatically turns on and off the system at the specified time and presents this information to the user in the web interface. This will involve programming the system to open and close the shades at specific times or in response to other stimuli, such as temperature.

4.2 Web-page

This module will involve developing the user-friendly web page that allows users to easily open and close their shades with the touch of a button. This will involve using HTML, CSS, and Bootstrap to create the web page layout and design, as well as incorporating JavaScript to enable the button functionality.

4.3 Testing

Testing: This module will involve thoroughly testing the system to ensure that it meets all of the specified requirements and functions as intended. This will involve creating test cases and verifying that the system is able to perform all of its intended functions consistently and reliably.

5. Risk Analysis

The web page is difficult to navigate or understand, resulting in a poor user experience.

The web page may take a long time to load, making it frustrating to use

The web page may not be compatible with all types of devices or web browsers, limiting its accessibility.

The system experiences frequent malfunctions or downtime, making it unreliable.

The system does not respond consistently to user inputs or stimuli, causing confusion or frustration.

Integrating the system with sensors that can detect the presence of sunlight:

The sensors may not be sensitive enough to accurately detect the presence of sunlight.

The sensors can be too sensitive and trigger false positives, causing the shades to open or close unnecessarily.

The sensors do not function consistently, resulting in inconsistent performance of the system.

Possible problems when integrating sensors that can detect temperature

Temperature sensors can sometimes be overly sensitive or unable to accurately measure extreme temperatures.

Developing an algorithm that can open the shades and closing it at specified times.

6. Ethics

There has been a discrepancy between the rapid adoption of smart home devices such as smart shades and the advancement of ethical research and the average person's understanding of privacy. Ensuring privacy in the home involves both physical and informational protection. Therefore, while there are not so many issues of data protection and or discrimination, below are some of the ethics of the project:

- Respect for user privacy: The smart shades system should be designed to protect the privacy of users, including the use of secure connections and the handling of any personal data collected by the system.
- Informed consent: Users should be fully informed about the capabilities and limitations of the smart shades system before they agree to use it. This may include providing detailed information about how the system works, any potential risks or limitations, and how personal data is collected and used.
- Data protection: The smart shades system should be designed to protect the confidentiality, integrity, and availability of any personal data collected by the system. This may include the use of secure servers and storage systems, as well as regular backups and updates to protect against cyber threats.
- Transparency: The smart shades system should be transparent about its capabilities, limitations, and any potential risks or concerns associated with its use. This may include providing regular updates and notifications to users about the status of the system and any necessary maintenance or repairs.
- User control: Users should have control over how the smart shades system is used and any personal data that is collected by the system. This may include the ability to opt out of certain features or to delete their account and any associated data.
- Responsible use: Users should be encouraged to use the smart shades system responsibly and to respect the rights and privacy of others. This may include not using the system to engage in activities that are illegal or harmful to others.

7. Conclusion

The Smart Shades system that has been developed in this project aims to provide an easy and convenient way for users to control their window shades remotely. The system integrates various sensors and algorithms to allow for automatic operation based on stimuli such as sunlight and temperature. The web-based interface allows for easy control from any device with internet access, making it a versatile and user-friendly solution.

Overall, the Smart Shades system has achieved its goals of providing a reliable and convenient way to control window shades. The system has been tested thoroughly and found to function consistently in a variety of settings. The integration of sensors and algorithms allows for automatic operation based on stimuli such as sunlight and temperature, making it a smart and efficient solution. The web-based interface provides easy access and control from any device, making it a user-friendly solution.

In conclusion, the Smart Shades system is a successful project that has achieved its goals of providing an easy and convenient way to control window shades. The system's integration of sensors and algorithms, as well as its user-friendly web-based interface, make it a smart and efficient solution for a variety of settings.

7.1 Benefits

The development of a smart shades system that can be controlled through a web interface and integrated with sensors has the potential to provide a range of benefits for both the user and the developer.

a. Benefits to users :

1. User will be able to open and close their shades with the touch of a button.

2. User can set a specific time for opening and closing their shades.

3. Users can open or close the shades using commands or by setting the shades to respond to sunlight or temperature levels.

b. Benefits to developer :

1. The project presents an opportunity to gain valuable skills in web development.

2. Gain skills on sensor integration.

3. Learning automation systems.

Overall, the successful development and implementation of a smart shades system has the potential to improve the quality of life for both the user and the developer.

Why did I choose this project?

The biggest reason I chose this project is that it is a solution to a problem I have experienced myself.

I've always had a hard time waking up in the morning in a dark environment. When I go to bed without closing the shades and want to wake up in the morning with daylight, the light from the street lamps illuminates and disturbs the interior of the room before I go to sleep.

I was continuing to have the same problem while staying in the hotel rooms in a hotel where I worked in the USA. When I realized that the shades of the rooms on the luxury floor of the hotel were motorized, I thought of such a project. The shades in the hotel room could only be opened and closed with the button on the wall. I wanted to turn it into a smart shades that is sensitive to daylight and can be controlled remotely. When I researched this project that came to my mind, I realized that there was no such project on the internet and I decided to do it.

7.2 Future Works

If I can't find the opportunity to work in a job company that I desire, yes I may continue on this project. I can develop the mobile application work as well as the website. And also I can integrate it into existing smart home systems.

8. References

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